CLAIMS

1. An effective refractive index type nitride semiconductor laser device comprising:

an active layer;

a p-side cladding layer formed on said active layer;

a p-side contact layer formed on said p-side cladding layer; and

a stripe-ridge-waveguide provided by selectively etching said p-side contact layer up to said active layer, said stripe-ridge-waveguide having a width ranging from 1 μm to 3 μm;

wherein said p-side cladding layer has a layer thickness of 0.1 μm or less at an etched region.

2. An effective refractive index type nitride semiconductor laser device according to claim 1 further comprising:

an insulating film formed on both etched side surfaces of said stripe-ridge-waveguide and on etched surfaces of nitride semiconductor layer continuing with the both etched side surfaces of said stripe-ridge-waveguide; and

an electrode formed on a surface of said p-side contact layer and said insulating film, the surface of said p-side contact layer being an upper surface of said stripe-ridge-waveguide,

wherein said insulating film includes a material other than Si oxide.

3. An effective refractive index type nitride semiconductor laser device according to claim 1 or 2, wherein said stripe-ridge-waveguide has a width ranging from 1.2 μm to 2 μm.

4. An effective refractive index type nitride semiconductor laser device according to claim 1, wherein said insulating film includes an oxide containing at least one element selected from the group consisting of Ti, V, Zr, Nb, Hf and Ta, or at least one element selected from the group consisting of SiN, BN, SiC and AlN.

5. A method of producing an effective refractive index type nitride semiconductor laser device comprising:

forming an active layer;

forming a p-side cladding layer containing a first p-type nitride semiconductor material over the active layer,

forming a p-side contact layer containing a second p-type nitride semiconductor material over the p-side cladding layer;

forming a first protective film in a stripe shape on a surface of the p-side contact layer;

etching the p-side contact layer up to the active layer through the first protective film, thereby forming the stripe-ridge-waveguide below the first protective film;

forming an insulating second protective layer to cover surfaces of the stripe-ridge-waveguide, the second protective layer including a material different from a material of the first protective layer; and

removing the first protective layer.

6. An effective refractive index type nitride semiconductor laser device comprising, an active layer, and a p-side optical waveguide layer, a p-side cladding layer and a p-side contact layer laminated on the active layer, and a stripe-ridge-waveguide provided by selectively etching said p-side contact layer up to said active layer,

wherein said p-side optical waveguide layer has a thickness of 1.0 μm or less at a projection region of a stripe structure included in said stripe-ridge-waveguide.

7. An effective refractive index type nitride semiconductor laser device according to claim 6,

wherein said p-side contact layer, said p-side cladding layer, and said p-side optical waveguide layer are selectively etched to form a stripe-ridge-waveguide including said p-side cladding layer, said p-side contact layer, and the projection region in said p-side optical waveguide layer.

8. An effective refractive index type nitride semiconductor laser device according to claim 6 or 7,

wherein said p-side optical waveguide layer has a thickness of 1500 Å or more and 4000 Å or less at the

projection region.

9. An effective refractive index type nitride semiconductor laser device according to any of claims 6 to 8,

wherein said p-side optical waveguide layer has a thickness of 500 Å or more and 1000 Å or less at a region other than the projection region.

10. An effective refractive index type nitride semiconductor laser device according to any of claims 6 to 9,

wherein the stripe-ridge-waveguide has a width ranging from 1 μm to 3 μm.

11. An effective refractive index type nitride semiconductor laser device according to any of claims 6 to 10,

wherein the projection region included in said p-side optical waveguide layer has a height of 100 Å or more.

12. An effective refractive index type nitride semiconductor laser device according to any of claims 6 to 11,

wherein said p-side optical waveguide layer includes $In_xGa_{1-x}N$ ($0 \leq x < 1$).

13. An effective refractive index type nitride semiconductor laser device comprising an active layer, n- and p-side optical waveguide layers, n- and p-side cladding layers, and n- and p-side contact layers laminated respectively on both sides of the active layer, and a stripe-ridge-waveguide provided by selectively etching said p-side contact layer up to said active layer,

wherein said p-side optical waveguide layer has a larger thickness than said n-side optical waveguide layer.

14. An effective refractive index type nitride semiconductor laser device according to claim 13,

wherein said p-side optical waveguide layer has a thickness of 1.0 μm or less at the projection region.

15. An effective refractive index type nitride semiconductor laser device according to claim 13 or 14,

wherein said p-side contact layer, said p-side cladding layer, and said p-side optical waveguide layer are selectively etched to form a stripe-ridge-waveguide including said p-side cladding layer, said p-side contact layer, and the projection region in said p-side optical waveguide layer.

16. An effective refractive index type nitride semiconductor laser device according to any of claims 13 to 15,

wherein said p-side optical waveguide layer has a thickness of 2500 Å or more at the projection region.

17. An effective refractive index type nitride semiconductor laser device according to any of claims 13 to 16,

wherein said p-side optical waveguide layer has a thickness of 500 Å or more and 1000 Å or less at a region other than the projection part.

18. An effective refractive index type nitride

semiconductor laser device according to any of claims 13 to 17,

wherein the stripe-ridge-waveguide has a width ranging from 1 μm to 3 μm.

19. An effective refractive index type nitride semiconductor laser device according to any of claims 13 to 18,

wherein said p-side optical waveguide layer includes $In_xGa_{1-x}N$ ($0 \leq x < 1$).

20. An effective refractive index type nitride semiconductor laser device comprising an active layer with at least a p-side first cladding layer, a p-side optical guide layer, a p-side second cladding layer and a p-side contact layer stacked thereon, a stripe-ridge-waveguide provided by selectively etching said p-side contact layer up to said active layer,

wherein said p-side optical waveguide layer has a thickness of 1.0 μm or less at a projection region of a stripe structure included in said stripe-ridge-waveguide.

21. An effective refractive index type nitride semiconductor laser device according to claim 20,

wherein said p-side first cladding layer is a carrier confinement layer including $Al_yGa_{1-y}N$ ($0 < y < 0.5$) and said p-side second cladding layer is a light confinement layer including $Al_zGa_{1-z}N$ ($0 < z < 0.5$, $y > z$).

22. An effective refractive index type nitride semiconductor laser device according to claim 20,

wherein said p-side first cladding layer comprises a first layer and a second layer, and

wherein the first layer includes $Al_xGa_{1-x}N$ ($0 < y < 0.5$) formed in nitrogen atmosphere and the second layer includes $Al_xGa_{1-x}N$ ($0 < y < 0.5$) formed in hydrogen atmosphere.

23. An effective refractive index type nitride semiconductor laser device according to any of claims 20 to 22,

wherein said p-side first cladding layer includes $Al_xGa_{1-x}N$ ($0 < y < 0.35$).